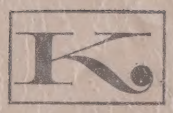
MODEL 500

MEGOHMMETER



KEITHLEY INSTRUMENTS, INC.

CLEVELAND, OHIO

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11. CIRCUIT DESCIPTION

Refer to the circuit diagram, DR 11716-C. In a 5886 tube, the grid-filament potential is proportional to the logarithm of the grid current when the current is positive. In the Model 500 circuit the plate current, which is proportional to grid potential, is read by the meter in the cathode circuit.

When a 10 megohm resistance is connected across the input, a grid current flows which causes a corresponding plate current. This is bucked out by a current from battery B1 through R6 and R8 so that the net meter current is zero. The meter, at zero current, is marked "10" megohms. R8 is adjustable so that the "10" megohm point may be calibrated with the internal standard, R1.

Resistances larger than 10 megohms cause smaller grid currents and grid bias is more negative. A more negative grid bias results in smaller plate current. The meter responds to the algebraic sum of buckout current and plate current and, plate current being smaller for larger resistors, this gives an upscale reading.

By inserting a standard 10^{10} ohm resistor, R2, with the calibrate switch, a meter deflection is obtained which may be set to the "10K" megohm position on the dial. The adjustment is made with R7 which controls meter sensitivity.

Thus the meter scale is fitted to the tube characteristic at two points. These are the CALIBRATE steps on the panel switch, and they should be checked each time the instrument is turned from OFF TO READ.

Battery B2 supplies the testing potential. The current flows from the positive battery terminal, which is the ground of the input connector, through the resistance being tested, from the grid to the filament of the vacuum tube, through the meter circuit (the testing current is much smaller than the plate current) to the negative battery terminal.

III. OPERATION

General purpose measurements with the Model 500 are made using the probe. It is attached by screwing it onto the input connector.

The tip of the probe is held against or connected to the high impedance, or well-insulated, terminal of the unknownresistance, and the clip lead (at ground potential) is connected to the low impedance or ground terminal of the unknown. With the panel switch in the READ position, the resistance of the unknown is read directly from the meter dial.

Cables with mating UHF connectors are attached to the Model 500 input connector to measure cable resistance or cable and ion chamber resistance. Non-mating connectors are accommodated by building an adapter, or by using the probe tip to contact the central conductor and connecting the alligator clip to the connector shell.

In rotating the panel switch from OFF to READ, it must be switched through the two calibrate positions, 10 and 10K megohms.

In preparing to make a measurement, first switch from OFF to "CALIBRATE 10" and set the meter pointer to 10 megohms with the potentiometer indicated by the line running to it. Next switch to 10K and set the meter pointer to the 10K megohms with the other potentiometer. These steps calibrate the logarithmic characteristic of the vacuum tube. Once calibrated, there is very little drift, and frequent recalibrations are not necessary. Next, switch to READ and measure the unknown resistance as discussed above. To conserve batteries, the instrument should be turned to OFF when not in use.

The major scale divisions are decade values, and the dots represent 2X and 5X the decade value. The first decade is marked 10, 20, and 50 megohms; the others follow the same pattern viz: 100, 200, 500; 1000, 2000, 5000; 10K, 20K, 50K etc.

Capacitance across an unknown resistance slows the response of the meter. For the Model 500 the empirical formula $T = \frac{RC}{32}$ gives the time in seconds required for the meter to attain 90% of its final reading. R is in megohms, and C in microfarads.

The operating procedure, therefore, is:

a) Fit probe, or other input adapter.
b) Calibrate 10 megohms
c) Calibrate 10K megohms
d) Read the unknown resistance
e) Turn instrument OFF after using.

IV. MAINTENANCE

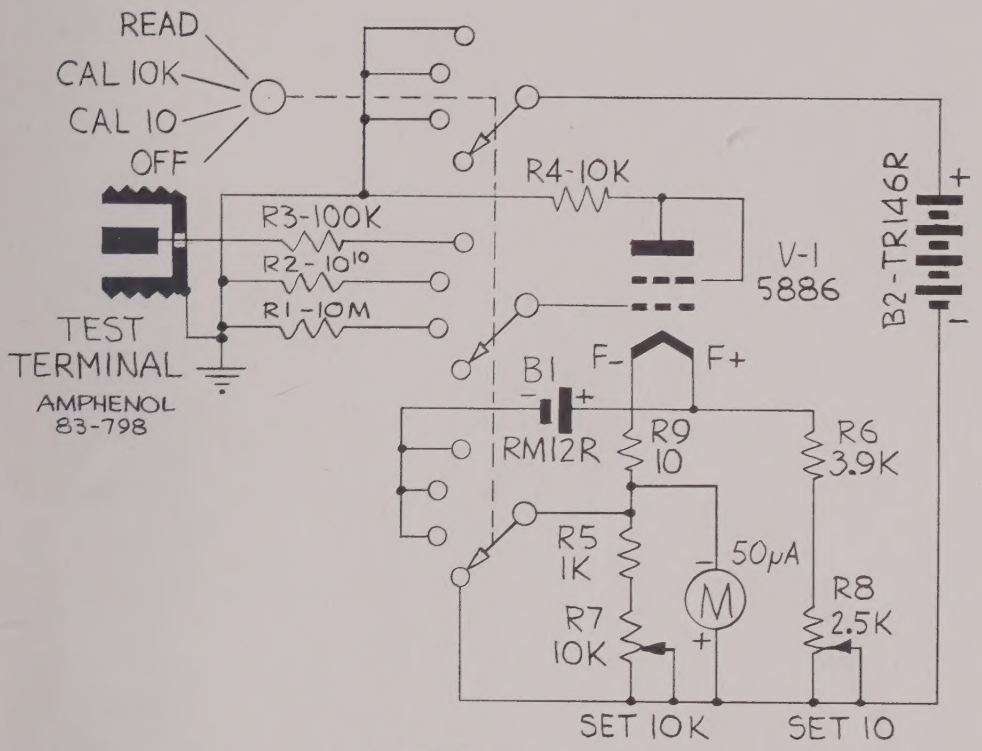
The teflon insulation of the probe and input connector should be kept clean at all times. Any insulation leakage resistance is in parallel with the unknown resistance, and can cause erroneous readings.

The batteries, listed in the table below, are the only components of the Model 500 requiring periodic replacement.

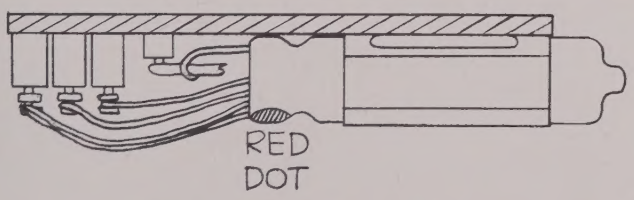
No. Required	Battery Type	Service Life
1	RM 12R	360 hours
1	TR 146R	2000 hours

These are mercury batteries, which maintain their terminal potential throughout their life, and lose their voltage quickly at the finish. As long as the Model 500 calibrates satisfactorily, the batteries are in operating condition. They are replaced by removing the screw from the bottom of the case, which allows the case to be removed. The cells are held in clips which are labelled with the type and polarity.

The 5886 tube should operate satisfactorily for many thousand hours. If replacement should be necessary, DR 11716-C shows the proper connections. No special tube selection is necessary. Care must be taken in handling the tubes not to touch the press; it has been especially cleaned and treated to maintain extremely high resistance from the grid to the filament leads, and finger contamination lowers the surface leakage resistance.



MODEL 500 SCHEMATIC DIAGRAM



TUBE INSTALLATION

WEK	1-14-58	DR 11716 C

545
Amitie
WHITE